REMARKS

Reconsideration of the application is respectfully requested.

Claims 1-11, 13, 16, 18-20, and 22 are pending. Claims 12, 14, 15, 17, and 21 have been previously cancelled. Claim 22 was added.

The Cross Reference to Related Applications paragraph was amended to correct a typographical error.

35 U.S.C. § 103

Claims 1-11, 13, 16, and 18-20 were rejected under 35 U.S.C. § 103(a) as being unpatentable over NPL to Cavani *et al.*, entitled “Effect of Water in the Performance of the Solid Phosphoric Acid Catalyst for Alkylation of Benzene to Cumene and for Oligomerization of Propene” (herein "Cavani") and WO 93/16020 to Mathys *et al.* (herein "Mathys") for the reasons stated on pages 2-7 of the Action. Applicants respectfully disagree.

Cavani is directed to a solid phosphoric acid ("sPa") catalyst. In contrast, the subject claims are limited to processes utilizing zeolite catalysts. Although Cavani and the subject claims concern water, there is no reasonable expectation of success that zeolite catalysts could necessarily and successfully be "dropped-in" in place of the solid phosphoric acid catalyst of Cavani, especially considering the unpredictability nature of the chemical arts. (*See* M.P.E.P. § 2144.08II.*A*.4.(e).) ("If the technology is unpredictable, it is less likely that structural similar species will render a claimed species obvious because it may not be reasonable to infer that they would share similar properties.") Indeed, there is no chemical similarity or analogy that can be made between the two catalyst types. (*See*, *for example,* M.P.E.P. § 2141.01(a) (Analogous and Nonanalogous Art) and M.P.E.P. § 2144.09 (Close Structural Similarity Between Chemical Compounds).)

In particular, water's role and function in oligomerization processes relating to sPa oligomerization and zeolite oligomerization is completely different; thus, one of ordinary skill in

the art would not expect the water used in Cavani to be used successfully or even useful in the claimed process. For example, in sPa oligomerization, water *chemically reacts* with the sPa catalyst to produce a family of acids when activated. These acids exist in equilibrium with each other and differ from each other in their degree of condensation. These acids include ortho-phosphoric acid (H_3PO_4), pyro-phosphoric acid ($H_4P_2O_7$), triphosphoric acid ($H_3P_3O_{10}$), and polyphosphoric acids, and the precise composition of a given sample of phosphoric acid will be a function of the P_2O_5 and water content of the sample. As the water content of the acid decreases, the degree of condensation of the acid increases. Each of the various phosphoric acids has a unique acid strength and accordingly the catalytic activity of a given sample of solid phosphoric acid catalyst will depend on the P_2O_5/H_2O ratio of the phosphoric acid which is deposited on the surface of the catalyst crystals. Thus, a skilled artisan not only needs water to produce the active species of the sPa catalyst, but must also maintain a targeted equilibrium of primarily the ortho and pyro forms to insure a continuous, productive process. (*See* paragraph [0007] of this application's publication, US 2007/0255081, discussing the effects if too much or too little water is used.) No such requirement exists with zeolite oligomerization. Therefore, one of ordinary skill in the art would not look to Cavani to practice the process of the claimed invention.

In contrast, in zeolite oligomerization, the active species of the catalyst is generally obtained through calcination and the exchange of ammonium ions that decompose to produce ammonia and a proton, thus, yielding the active site. Water is not required to maintain the Bronsted acidity of the catalyst as in Cavani. Rather, water is provided to be absorbed into the sieve of the catalyst to first temper or physically block some active sites of the highly active catalyst in the initial phase of the process to insure continuous and steady state process conditions to avoid "spiking" or premature "burn-out." In the latter phase, as the pores of the molecular sieve are "coked" or carbonaceous material is deposited thereon, thus, decreasing catalyst activity, less water is provided to "unblock" catalyst sites to maintain catalyst activity and continuous steady state conditions. The water and its removal also help with the removal of catalyst poisons of the highly sensitive zeolite catalyst. Thus, water's role and function are completely different in zeolite oligomerization as compared to sPa oligmerization and, thus, the teachings of Cavani are not directly transferrable to the claimed invention.

With reference to Mathys, the subject claims recite among other things *wherein the water content of the feed is from 450 to 800 wt ppm during the initial phase of the process of conversion and the latter phase of the process of conversion is from 250 to 400 wt ppm*. Mathys fails to appreciate that variable water concentration as claimed provides additional benefits as explained in the previous paragraph. In particular, Mathys exemplifies and suggests feeding water into the oligomerization process at or close to fixed rates within the ranges disclosed therein through-out a reactor run. Thus, Cavani and Mathys do not teach water having essentially the same effect on sPa and zeolite catalysts and fail to disclose or suggest the *select* combination of the specific ranges for the water content for the initial phase and latter phase of the process of conversion of the subject claims. As such, Applicants respectfully submit that the subject claims are patentable over Mathys and Cavani and request withdrawal of the rejection.

Applicants respectfully solicit a prompt notice of allowability. In the alternative, Applicants invite the Office to telephone the undersigned attorney if there are any other issues outstanding which have not been presented to the Office's satisfaction.

Respectfully submitted,

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